

# Pump Concrete 600 Feet on Viaduct Contract in Milwaukee

**Continuous Flow of Concrete Delivered at Rate of 27 Cu. Yd.  
An Hour—Use Ready-Mixed Concrete from Commercial  
Plants**

CONCRETE is being pumped to a maximum height of 75 ft. and a horizontal length up to 600 ft. in the placing of the reinforced concrete deck of the 35th Street viaduct in Milwaukee, now under construction for that city.

This viaduct ranks among the important structures being built this year. It is primarily a steel structure, but the abutments and the deck slab are of concrete. The length of the viaduct is 3,440 ft. between abutments. It carries 35th Street across a network of railway tracks and will be an important factor in traffic circulation in Milwaukee.

## Concreting the Deck Slab

The concrete for the south abutment, built in 1932, was placed with pumping equipment similar to that now being employed in concreting the heavily reinforced deck slab. The south abutment was, in fact, the first structure placed with this type of equipment in the United States.

The quantity of concrete required in the deck slab amounts to 8,300 cu. yd. The photographs from which the accompanying illustrations were made were taken on August 18, at which time the concrete was being pumped

through a vertical lift of 45 ft. and a horizontal distance of 500 ft.

Figure 1 shows the pump, with the 6-in. pipeline leading toward the viaduct, and a truck mixer with an agitator body delivering ready-mixed concrete to the hopper from which the pump is fed.

## The Pumping Equipment

The pumping unit is known by the trade name of Rex Pumpcrete, a single-cylinder unit with a gasoline-engine drive. On the 35th Street viaduct it is placing concrete at an average volume of 27 cu. yd. per hour.

This equipment is not in any sense pneumatic. It pumps concrete in a continuous flow, much as a pump of the plunger type pumps water.

The 6-in. pipeline leading away from the pump continues to the edge of the viaduct, where it is turned in a vertical direction by means of a curved pipe section having a radius of 5 ft. A similar curved section is shown in Figure 2, at the deck level, from where the pipeline again takes a horizontal course toward the point of discharge.

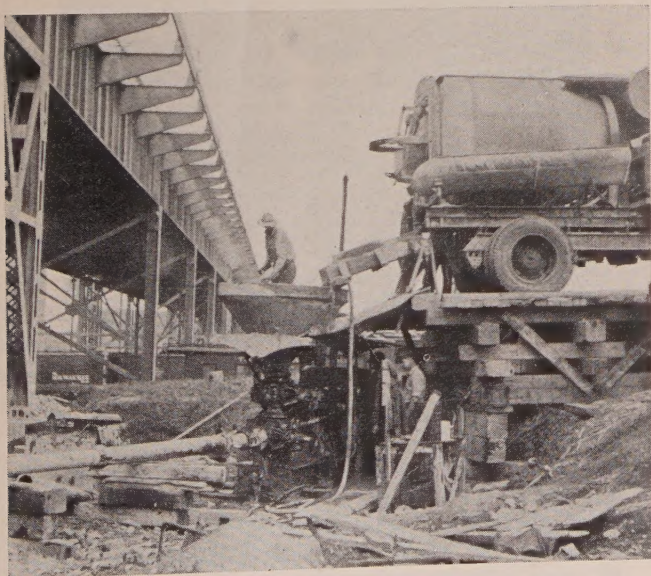


Figure 1. Concrete pumping unit at center of picture, with pipeline leading toward viaduct. Ready-mixed concrete being delivered to pump hopper

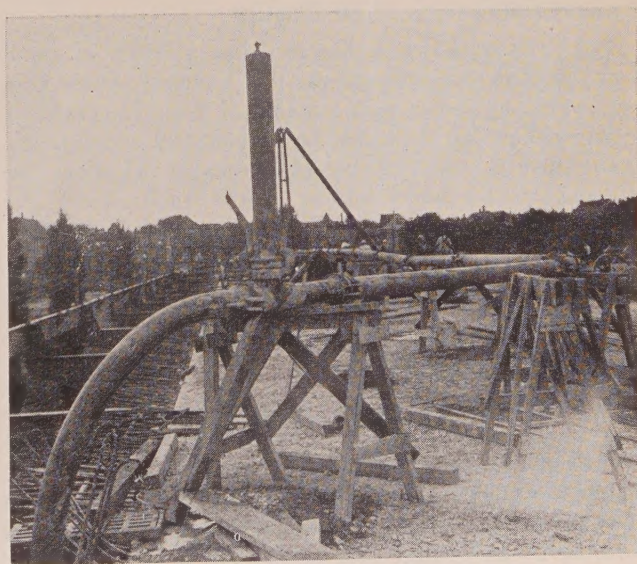


Figure 2. Scene on deck of viaduct, showing 6-inch pipeline with one section curved to a radius of 5 feet

The pipeline consists of sections 10 ft. long, each section having a flange at each end, against which a rubber washer is fitted. The pipe sections are quickly joined by means of a coupling of the toggle type. A flexible end section is, of course, required at the discharge end, as shown in Figure 3.



Figure 3. Flexible pipe section at discharge end facilitates distribution of concrete. Puddling with high-frequency vibrators

The construction crew readily became accustomed to the placing routine, as a result of which the concreting operations are proceeding smoothly and efficiently.

#### Concrete Maintains High Quality

The concrete shown in Figure 3 had a slump of about 4 in., though experiments on this contract resulted in satisfactory operation with a slump of 2 in. Examination of the concrete as it was discharged from the pipeline disclosed that it possessed the same quality as when discharged into the pump hopper by the truck mixers. No segregation or separation of aggregates had occurred.

Figure 3 also shows two high-frequency vibrators employed in puddling the concrete around the heavy reinforcement.

#### Cleaning the Pipeline

At the end of a run of concreting, as at night, the pipeline is cleaned thoroughly by means of a plunger-like device, or "go-devil," which is forced through the full length of the pipe under water pressure. Circular discs at each end of the plunger are fitted with rubber rims, which form the actual contact with the inner surface of the pipe. In this manner the pipeline is cleaned out thoroughly and no concrete is wasted.

The superintendent follows the practice of leaving the

water in the pipeline after the plunger is forced through, so that the inside of the pipe is thoroughly wet at the beginning of the next run.

#### Acknowledgments

The Rex Pumpcrete equipment is manufactured by the Chain Belt Company, of Milwaukee, and is supplied to contractors on a rental basis. While the coarse aggregate on the 35th Street viaduct is of moderate size, the pump will actually handle concrete with coarse aggregate in sizes up to 2½ in.

The Wm. M. Christensen Construction Co., of Racine, Wis., has the contract for excavating and concrete work on this project. James Lavin is the superintendent of construction for this contractor.

#### Witt Appointed Consulting Editor of "Concrete"

J. C. Witt, Chemical Engineer and Director of Research for the Universal Atlas Cement Company, has been appointed Consulting Editor of "Concrete," in which capacity he has, in fact, acted unofficially for the past year or two.

Educated in chemical and mechanical engineering, Dr. Witt has been a specialist in the manufacture and use of cement and other mate-



rials of construction for a number of years. In the cement industry he has been plant superintendent, chemical engineer, consultant, and research director. He has contributed numerous articles to scientific and technical journals.

Dr. Witt's association with "Concrete" and the "Cement Mill Edition of Concrete" will be of very definite value to our readers.—Editor.

# Blast-Furnace Slag Long Accepted as Concrete Aggregate

**Small Quantity of Sulphur No Source of Danger—Material  
Has Approval of National Societies and U. S. Government**

THE question of sulphur in blast-furnace slag has been settled "once and for all" so many times—invariably in favor of slag—that architects and engineers should have lost all fear of it.

The National Bureau of Standards has examined and tested blast-furnace slag as an aggregate for concrete and has given it a clean bill of health. So has the U. S. Bureau of Public Roads. Numerous technical committees representing various national technical organizations and manufacturers' associations have investigated the subject and have reported favorably on the use of slag in concrete work. Invariably the verdict has been that where sulphur was present the quantity was too small to be harmful. Or, in many cases, especially where the slag was changed from the molten to the solid form by some rapid-cooling process, the small quantity of sulphur present was "locked up" in chemical combinations that rendered it completely harmless.

## The Sulphur Bogey Reappears

Nevertheless, the bogey of sulphur continues to be raised, sometimes in all sincerity, but more frequently by those who have a special interest in raising it.

One of the most comprehensive reports now available on the subject of blast-furnace slag as an aggregate for concrete was that prepared by Committee 201 of the American Concrete Institute, acting under the chairmanship of H. F. Clemmer. That report appears in the October (1930) *Journal* of the A. C. I.,<sup>1</sup> under the heading of "Blast-Furnace Slag as Concrete Aggregate."

One valuable feature of the Clemmer report is found in its extensive discussion of previous tests and investigations. Many of those investigations are given individual treatment in this 37-page report, and a bibliography of 60 articles and reports supplies access to a great mass of information on the subject.

## Slags in Two General Classes

The Clemmer committee points out that slags are of two general classes, when considered with respect to the method of handling the molten material on leaving the furnace. These two general classes are—

(1) Slag which is brought from the molten to the solid form entirely through the agency of atmospheric air, known as air-cooled blast-furnace slag.

(2) Slag which is changed from the molten to the solid form by means of water or other rapid-cooling agency, known as granulated slag.

At the very beginning of the report of the Committee 201 of the A. C. I. the following impressive statement appears:

The technical committees of practically all the national organizations interested in construction materials have approved the use of slag aggregate in specifications or reports, including the following: American Concrete Institute, American Society for Testing Materials, American Railway Engineering Association, American Society for Municipal Improvements, Associated Tile Manufacturers, National Paving Brick Manufacturers' Association, Portland Cement Association, Asphalt Institute, American Association of State Highway Officials, Federal Specifications Board, U. S. Bureau of Public Roads (Department of Agriculture), National Bureau of Standards (Department of Commerce), and the state highway departments of Alabama, Delaware, District of Columbia, Florida, Georgia, Kentucky, Maryland, Mississippi, Missouri, New York, New Hampshire, South Carolina, Ohio, Pennsylvania, Utah and West Virginia.

After reading this imposing list of organizations which have approved blast-furnace slag, it may be well to paraphrase Charles Dickens by asking "Now then, is there any other boy who thinks the sulphur in slag is harmful to concrete?"

Not content with this, the Clemmer report quotes from a number of sources whose authoritative character can not be questioned. For example, the following is taken from the *Proceedings* of the A. S. T. M.:<sup>2</sup>

A large amount of test data has shown this material [blast-furnace slag] to be acceptable as concrete aggregate, and there is also a large amount of data from the field in testimony of the permanence and durability of slag concrete structures.

No restriction has been placed upon the sulphur content of slag, for the reason that inspections made by members of the committee of reinforced slag concrete structures in the course of demolition showed no corrosion of reinforcement that could be attributed to slag, nor is there any published evidence that such corrosion has been observed, so far as the committee is aware.

## No Corrosion of Steel

The closing sentence of the foregoing statement answers a question that is often raised by engineers—namely, whether slag, or the sulphur in the slag, has any corrosive effect on steel reinforcement and service pipes. The answer definitely scouts the idea of harm from that source.

The Clemmer committee adds its own testimony on this point, with the assertion that there has never been a case where slag has been shown to have affected the reinforcing steel in any way, and many authorities on concrete have expressed a decided belief that such action can not happen.

## Bureau of Standards Report

This question of corrosion or disintegration because of sulphur was also investigated in tests conducted by the National Bureau of Standards.<sup>3</sup> The following is taken from the Bureau's report:

To the extent of the tests there was no sign of disintegration

<sup>1</sup> Also available in a reprint published by the National Slag Association, Leader Building, Cleveland, Ohio.

<sup>2</sup> Report of Committee C-9, *Proceedings* of A. S. T. M., 1923.

<sup>3</sup> Bureau of Standards: "Blast-Furnace Slag as Concrete Aggregate," Sept., 1921.

[of concrete] due to sulphide sulphur or other causes. In the past there has been some hesitation on the part of engineers to permit the use of slag aggregate without certain special limitations on the material, such as weight per cubic foot and sulphur content. Experience has shown, however, that there is probably no greater need for such restrictions in the case of blast-furnace slag than for other commonly used and accepted aggregates.

### Other Authorities Approve

Sanford E. Thompson<sup>4</sup> made an investigation of slag concrete, some years ago, to determine the durability of the material. He visited several cities where slag had been in use in concrete work for many years, and made both chemical and physical tests. He found no authentic cases of deterioration of slag concrete made with portland cement, or of rusting of steel reinforcement in such concrete.

A. T. Goldbeck<sup>5</sup> had this to say in further support of the assertion that slag concrete has no adverse effect on steel reinforcement:

I know of no cases of well-defined corrosive action on reinforcing steel in slag concrete. I examined, some 8 years ago, sections of reinforcing steel removed from a concrete slab in our presence at the Swedeland (slag) plant in Pennsylvania. The sections removed were about 3 ft. long. Two of them were perfectly sound, one end of the third rod had a few pits, showing no rust, but the surfaces were perfectly bright. Since the slab removed had been situated between electric railroad tracks, and since there was considerable moisture present, I have always felt that this pitting might have been due to electrolytic action. We were told that this slab had been constructed 11 years prior to the time of our inspection.

### Slag Gets the Blame

Human nature is responsible for at least some of the unverified reports of damage from the supposed sulphur in slag concrete. If anything goes wrong with slag concrete, as in the case of electrolytic action, or even ordinary cases of slipshod placing of concrete, and if disintegration develops, the easiest explanation is to place the blame on the slag.

### Something About the Chemistry

Those who are inclined to delve further into the chemistry of blast-furnace slag will find interesting reading matter in the report of investigations by L. G. Carmick.<sup>6</sup> He explains that slow cooling of molten slag will cause the calcium orthosilicate in certain slags to pass through three forms (alpha, beta and gamma), the last of which involves a volume increase of about 10 per cent. However, if the general practice is followed and the molten slag is poured in thin layers, or caused in some other way to cool quickly, the calcium orthosilicate is arrested at the beta form, which is entirely stable and involves no volume change.

### Sulphur in Slag and Cement

So far as the sulphur content is concerned, blast-furnace slag may contain less of that ingredient than is found in portland cement itself. Tests conducted by the Robert W. Hunt Company in 1930 disclosed an interesting comparison between the chemical analyses of a specially processed water-cooled granulated slag and a well known

brand of portland cement. The first two columns of figures in the table show the results of that analysis. The

TABLE—CHEMICAL ANALYSIS OF SLAGS COMPARED WITH PORTLAND CEMENT

|                           | Specially<br>Processed<br>Granulated<br>Slag, Per Cent | Portland<br>Cement,<br>Per Cent | Blast-Furnace<br>Slag in General,<br>Per Cent |
|---------------------------|--------------------------------------------------------|---------------------------------|-----------------------------------------------|
| Silica .....              | 34.00                                                  | 21.17                           | 32—40                                         |
| Iron oxide .....          | 4.95                                                   | 1.67                            | 0.5— 2                                        |
| Aluminum oxide .....      | 14.05                                                  | 6.79                            | 10—17                                         |
| Calcium oxide .....       | 38.83                                                  | 64.27                           | 30—49                                         |
| Magnesium oxide .....     | 3.24                                                   | 2.36                            | 3—14                                          |
| Manganese oxide .....     | —                                                      | .62                             | —                                             |
| Sulphuric anhydrite ..... | 1.42                                                   | 1.76                            | 1— 2                                          |

last column is the general range of chemical composition of blast-furnace slags as reported by the Clemmer committee. In addition, the processed slag (first column) contained 2.42 per cent of calcium sulphide, in a form and quantity that could not do any damage, either to concrete or steel.

Assuredly, there is no cause for hesitation in using blast-furnace slag, either air-cooled or processed, as an aggregate in concrete work.

## Better Housing Association Is Organized

Out of the meeting of the National Conference on the Renewal of Home Building, held at Chicago last spring and reported in the June issue, has now grown the National Association for Better Housing. Its first annual convention will be held at Chicago in the early fall, when a national program of action is to be submitted.

The purpose of the group is to bring together for conference, study and common action, those persons, businesses, trades and professions interested in better housing, sounder community planning and more extensive home ownership, according to J. Soule Warterfield, vice-president of the National Conference.

The organization is composed of 27 men, all prominent in the fields of building materials and equipment, architecture, finance, real estate, city planning, research, social welfare, and government.

Henry A. Guthrie, with offices at 59 East Van Buren St., Chicago, is secretary.

## U. S. Civil Service Examinations Are Begun

The United States Civil Service Commission announces open competitive examinations for the positions of senior engineer, engineer, associate engineer, and assistant engineer. Applications for the positions must be on file with the U. S. Civil Service Commission at Washington, D. C., not later than September 28, 1933.

## Claim Record Yardage in Boulder Dam Placing

More than 100,000 cu. yd. of concrete were placed on Boulder Dam during July. This is far in excess of the record on any other construction job, according to Chas. F. Shea, construction executive of Six Companies, Inc.

<sup>4</sup> Thompson: "Slag as Concrete Aggregate," *Proceedings*, A.C.I., 1917.

<sup>5</sup> Goldbeck: Correspondence with National Slag Association, July 15, 1932.

<sup>6</sup> Carmick: "Study of Composition of Blast Furnace Slags," *Proceedings* of the A. S. T. M., 1921.

# Cell House of Monolithic Concrete at Illinois Prison

**Concrete of High Quality Obtained Through Careful Supervision—Thin Cell Walls Heavily Reinforced—Roofing Tile of Precast Colored Concrete**

By BRYANT E. HADLEY

Architectural Assistant, State Division of Architecture and Engineering, Springfield, Ill.

THE new cell house of the southern Illinois penitentiary, overlooking the Mississippi River at Menard, is the first state-owned building in Illinois to be built entirely of monolithic concrete—both exterior and interior.

## Building Rectangular in Plan

In plan this building is 64 ft. 8 in. wide and 410 ft. 4 in. long. The interior consists of a cell block 28 ft. wide and 356 ft. 4 in. long. The cell block is built on a separate foundation, and, with the exception of the large ceiling slab of reinforced concrete, it is not connected in any way with the exterior walls of the building. The cell block contains five tiers of cells, 100 cells to the tier, or a total of 500 cells, each housing two men. On each tier the cells are arranged in two groups of 50 each, placed back to back. The floor-to-floor height of cells is 8 ft.

The rectangular form of plan adopted for the building is in line with experience, inasmuch as this type has been proved the most practical for the modern penitentiary. Each cell receives a maximum of daylight through the large windows occupying much of the exterior wall area.

## Cells of Reinforced Concrete

The cells are constructed entirely of heavily reinforced concrete, the side and back walls being 5 in. thick with the exception of about 3 ft. at the front, or jamb, which is increased to 8 in. to receive the metal panels containing the cell door and lock-operating devices. At each tier

floor level above the first a 3 ft. 6 in. walkway of reinforced concrete cantilever design extends all along the two sides of the cell house.

Between the backs of the rows of cells, on each tier, is a utility corridor, 5 ft. wide. These corridors contain all of the plumbing and ventilating stacks and supply line, and they are accessible to the maintenance crew at all

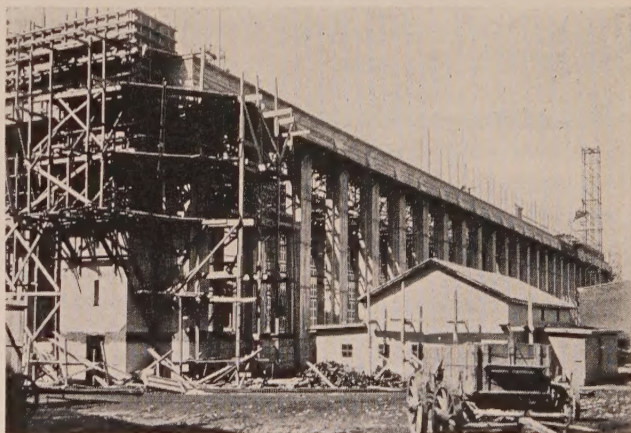


Figure 2. Cell house under construction

times. Iron stairs at each end of the cell block give access to the tiers.

The foundation for the exterior walls is partly in solid surface rock, merely deep enough to be below the frost line. Other sections of the foundation wall extend to depths of 18 to 22 ft. below grade, because of the existence of so-called underground streams which had cut sub-surface channels through the rock.

## Careful Supervision Maintained

The concreting equipment included two 4-bag mixers, and the concrete was distributed by buggies operating on runways. Prisoners provided all of the common labor and a considerable part of the general skilled work such as the placing of reinforcing steel. Prison laborers worked under the immediate supervision of competent foremen, one foreman to each squad. The scaffolding, runways and form work are shown in Figure 2.

A general foreman representing the superintendent of the Illinois State Division of Architecture and Engineering supplied general supervision over the work.

Dense concrete of very high quality was obtained, and the exterior and interior surfaces were left practically as they appeared on removal of forms. Up to the sills of

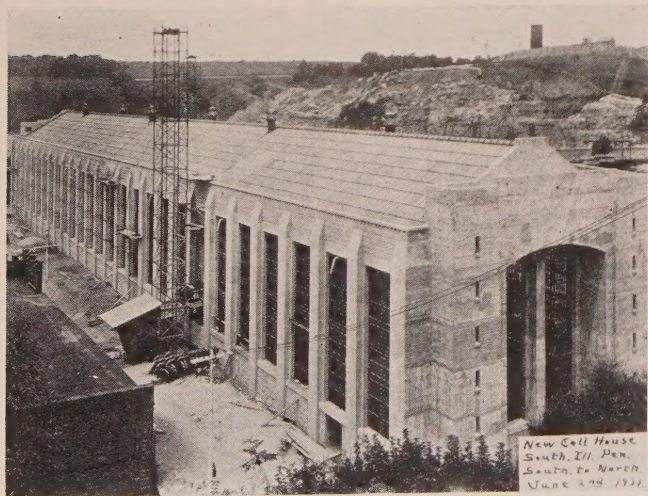


Figure 1. Cell house built entirely of monolithic concrete, with roof of precast colored concrete tile

the large windows the inner surface of the forms was lined with molds to give the finished surface the appearance of rusticated stone work. This feature was successful and greatly improved the appearance of the building from the exterior.

It should be emphasized that the high quality of the concrete work is due entirely to the careful and competent supervision maintained at all times, not only in the proportioning, mixing and placing of the concrete, but also in the erection of form work and the placing of steel reinforcement. The supervising forces were well organized and the construction work operated smoothly from start to finish.

An interesting feature is seen in the precast colored concrete roofing tile supported by steel roof trusses.

### Quantities of Material

Quantities of material used in this project included 16,618 bbl. of cement, 500 tons of steel bar reinforcement and 17 tons of mesh. The entire cost of the structure was \$489,000. The building is heated from a central power plant serving all buildings of the prison.

Plans and working details for this building were prepared by the office of C. Herrick Hammond, state supervising architect.

## Branches of Construction Industry Submitting Codes

The construction industry as a whole, and many of the separate branches of that industry, are taking up their positions in the NRA parade. Some have submitted their codes and others have such documents in preparation. Following is the status of branches of the industry not previously reported, in the August issue of CONCRETE, pages 9 and 10.

**Construction Industry.** The Construction League of the United States, representing all major groups of the construction industry, submitted its proposed code on August 7. Some changes were then made and the code was resubmitted on August 11. Minimum wage for unskilled labor was fixed at 40 cents an hour, with a maximum average of 35 hours a week in any period of six months, and an absolute maximum of 48 hours in any one week. The Construction League has also set up a committee to expedite the preparation of codes for the various separate branches of the construction industry.

**Engineering Profession.** A code for the engineering profession is being prepared under the leadership of the American Society of Civil Engineers and in co-operation with a number of other national engineering societies. Meetings were held in New York on August 2 and 21, and in Chicago and San Francisco. The code, which provides minimum fees for professional services, was submitted to the executive committee of the A. S. C. E. on August 25, and after a study by that committee it will be submitted to the NRA.

**Concrete Masonry.** The Concrete Masonry Association has prepared a code of fair competition for its branch of the concrete products manufacturing industry, and has submitted it to the industry for criticism. A general meeting will be held at an early date.

**Concrete Burial Vaults.** The National Concrete Burial Vault Association held a largely attended meeting at the Palmer House in Chicago on August 23, to consider the

tentative code previously drafted. Only minor changes were made in the printed draft previously submitted to the industry, and the code was approved for submission to the NRA.

**Lime Industry.** The proposed code for the lime industry, sponsored by the National Lime Association, was one of the first of the construction industry codes to be submitted to the NRA. The public hearing on this code was held in Washington on August 8, before Deputy Administrator Malcolm Muir.

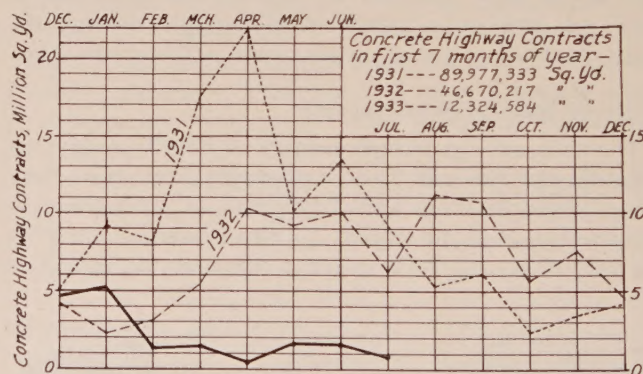
**Ready-Mixed Concrete.** The National Ready-Mixed Concrete Association is sponsor for the proposed fair trade code for that industry. A printed draft was mailed to producers. Following a general meeting in Washington on August 10 and 11, the code was submitted to the NRA and is now awaiting determination of the date for a formal hearing.

**Concrete Aggregates.** As reported in the August issue of CONCRETE, the name of the National Slag Association was inadvertently omitted as one of the sponsors of the unified code designed for all the concrete aggregate groups. The proposed code was approved at a general meeting of the industry, held in Chicago in July, and was submitted to the NRA. The public hearing was set for August 28.

## Concrete Highway Awards Show No Pick-Up in July

Contracts for concrete roads continued at a low figure in July, having fallen off below one million square yards for the second time this year.

Some contracts have been let during August on the programs to be financed by the \$400,000,000 fund allocated to the states under the provisions of Title II of the



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National Industrial Recovery Act. The administration of that fund, however, continues under conditions which suggest lack of energy at the head.

It is hoped that changes in administration may soon be made which will cut the legalistic red tape and inject some form of stimulant.

## PERSONAL

Edgar P. ("Jake") Golden, owner of the Hammond Concrete Block Works, passed away recently.

The plant is located on Calumet Avenue, Hammond, Ind.

# Tests Prove Cotton Pads Effective for Curing Concrete Roads

## Pads Submitted by Texas State Highway Department Tested by Bureau of Public Roads—Thin Mats Found Efficient

THE importance of minimizing temperature changes within concrete, especially during the early curing period, is well recognized. In connection with this problem the possibility of utilizing the heat insulating properties of mats made up of several plies of raw cotton separated by loosely woven cotton cloth has been suggested and samples of cotton mats containing 3, 6, and 9 plies of cotton were submitted for test purposes by the Texas state highway department. These mats measured approximately 1, 2, and 3 in. in thickness, respectively. The dry mats showed the following average weights per square foot:

|             | Lb. |
|-------------|-----|
| 3 ply ----- | 0.7 |
| 6 ply ----- | 1.2 |
| 9 ply ----- | 1.7 |

Tests were conducted by the U. S. Bureau of Public Roads at the Arlington Experimental Farm to determine the efficiency of these mats for curing concrete. These tests involved two separate investigations, one a study of the heat insulating value of the mats when applied to a concrete surface and the other the ability of the mats to retain moisture within the concrete and thus promote efficient curing.

### Temperature Tests

In order to determine the relative protection from heat absorbed from the sun's rays afforded to concrete pavement slabs by the cotton mats, tests were conducted in which the surface temperatures of small concrete slabs covered with these and other materials and exposed to the rays of the sun were measured over the daily temperature cycle.

Six concrete slabs each 2 ft. square and 6 in. thick were constructed for the tests, a typical paving mixture being used. In the upper face of each slab, at the mid-point and one-fourth inch below the surface, a copper-constantan thermocouple was installed to indicate the surface temperature of the concrete during the tests. Three of these slabs were covered with sections of the three thicknesses of cotton mats, while for comparison the other three were covered as follows: No cover, double burlap, and a bituminous cutback coating.

This portion of the report represents the results of a series of tests made to determine the flexural strength at 28 days of mortar specimens cured for 3 days under 3-ply, 6-ply, and 9-ply cotton mat, as compared with the strength developed by specimens cured with a double thickness of burlap kept wet during the same period.

The following methods of retaining moisture were studied:

- Double thickness of burlap, kept wet 3 days.
- Double thickness of burlap, wet once when applied.
- Three-ply cotton mat, wet on one side when applied.
- Six-ply cotton mat, wet on one side when applied.
- Nine-ply cotton mat, wet on one side when applied.
- Three-ply cotton mat, dry when applied.
- Six-ply cotton mat, dry when applied.
- Nine-ply cotton mat, dry when applied.

Test specimens consisted of mortar mixed in the proportion of 1 part cement to 2 parts sand by weight, with 14 per cent water. This produced a mortar of such consistency that a film of free water showed on the surface of the specimens shortly after molding. The specimens were approximately 11 in. in length by 6½ in. in width by 2 in. in thickness and were molded in watertight pans of sufficient depth to take the specimen and the curing mat. Mats were applied after the specimens had been exposed to the air of the laboratory for approximately 2½ hours after molding.

All of the curing mats except the double thickness of burlap, kept wet 3 days, were cut to fit the pans and the edges sealed with paraffin to prevent moisture loss except through the top. In the case of the wet burlap the covering material was cut longer than the specimen and the free end was immersed in water. This provided an ideal curing condition for the 3-day period. The results of the tests made with this mat are used as the standard of comparison.

In view of the fact that the 3-ply mats gave as good results from the standpoint of moisture retention and strength as the 6- and 9-ply mats, it was decided to repeat the tests, using mats made up of 1 and 2 plies of cotton. In order to tie in the results with the previous work, tests of the 3-ply mats as well as the double burlap, kept wet 3 days, were repeated. The same test procedures were followed throughout the supplementary series, the only variation being the thickness of the mats.

The results of these further tests indicate quite definitely that the 1- and 2-ply mats are just as effective in retaining water as the 3-ply and thicker mats, within the limits of these tests.

The fact that, in each group, the strengths of the wet mats of different thicknesses are substantially the same leads to the conclusion that for all practical purposes the 1- and 2-ply mats are just as effective as the 3-, 6- and 9-ply mats. This conclusion is verified by a consideration of the relative moisture losses sustained. It has been shown that, for the mats which were wet when applied, the amount of moisture is virtually the same, regardless of the thickness of the mat.

Extracted from detailed illustrated report in July (1933) issue of *Public Roads*, published by the U. S. Bureau of Public Roads, Washington, D. C.

# Data for Design of Retaining Walls

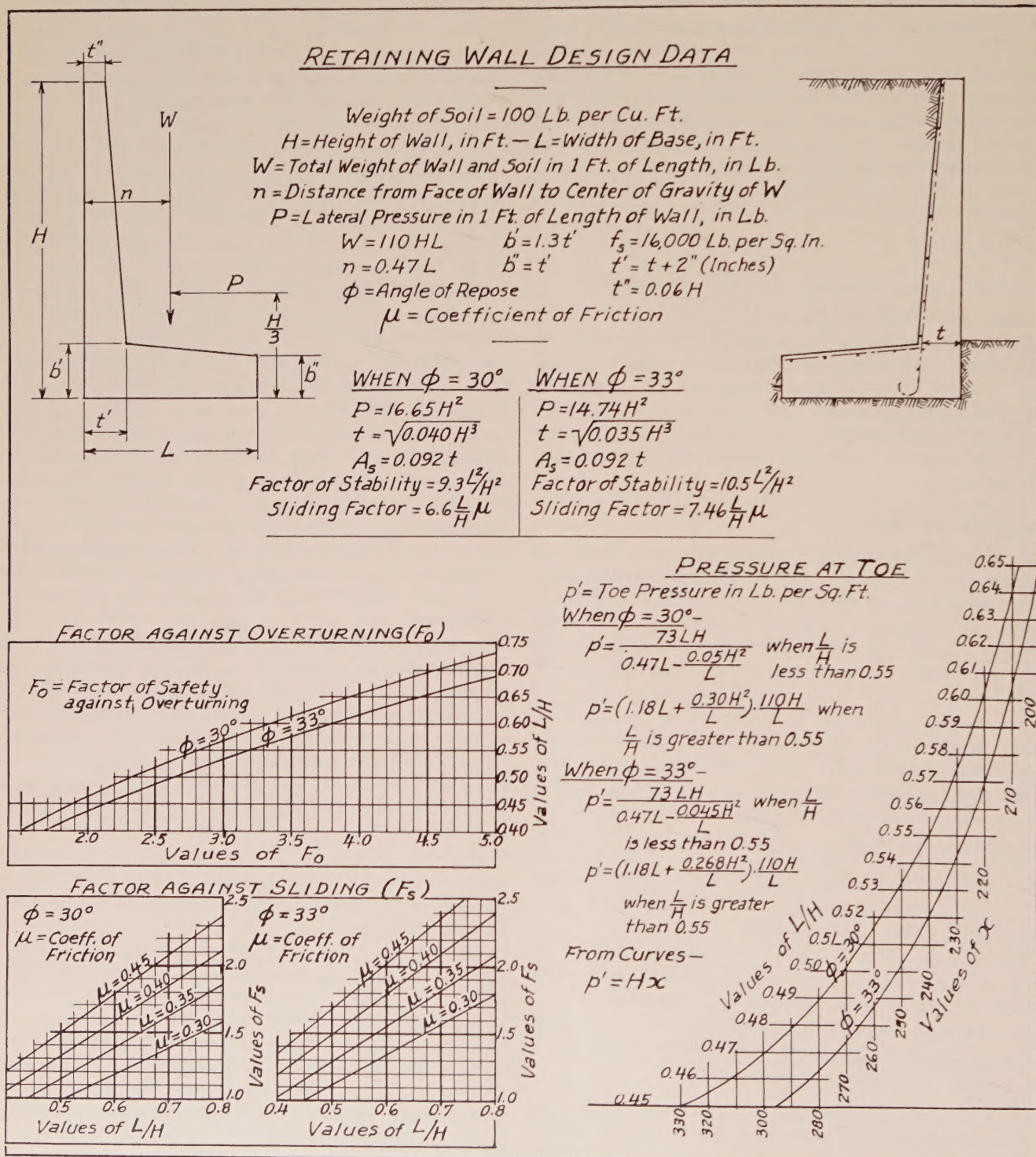
By A. H. T. WILLIAMS  
Consulting Engineer, Portland, Oregon

The information contained in the accompanying chart supplies the designer with the necessary data for the design of retaining walls of the type shown, for the conditions usually encountered.

The 28-day strength of the concrete was assumed at 2,000 lb. per sq. in. The use of concrete of higher strength would result, theoretically, in different values for

$t, t', b', b''$  and  $A_s$ ; but even if the values here given were used, the error would be on the side of safety. No other values would be affected.

Designers having cases in hand where the angle of repose of the retained material is outside the range of 30 to 33 deg. should follow the computations through and add the new data to the chart.



# EDITORIAL

## *Aid in Starting Public Works Projects*

**D**EFERMENT of construction and improvement in the fields of water works and sewage disposal, during the past three years, is creating several unfortunate situations.

As pointed out by the national recovery committee affiliated with the American Water Works Association, delay in the construction of needed plants and extensions is not only endangering the public health, but it means that at some later period taxpayers will be called upon to pay double the amount for which these projects could be built now.

As a means of stimulating activity in the construction field and getting federal public works funds into circulation, this national committee, headed by Malcolm Pirnie, president of the American Water Works Association, has organized local committees to cooperate with the federal public works administration.

These local committees, aided by the national group, will assist local communities in the presentation of their projects and filing of applications for federal loans. They will assist local administrators and officials of municipalities, counties and states who are charged with the receipt and expenditure of NRA funds.

Local construction interests in communities where public works improvements of this character are needed will see the wisdom of utilizing the services of this national committee and its local branches as a means toward speeding up the project.

If your community is holding up necessary improvements, and if there is no local branch of the American Water Works Association available, get into touch with the national committee through Mr. Pirnie.

## *The Significance of Tests*

**A**MONG the papers and reports presented during the annual meeting of the American Society for Testing Materials, held in June, there is one that deserves more attention and study than it has thus far received.

The paper to which reference is made is the extensive Report on Significance of Tests of Concrete and Concrete Aggregates.

The report consists of three sections, the first of which covers the "Significance of Tests for Characteristics of Concrete." Nine nationally known authorities contributed to this subject.

The second section, headed "Significance of Tests for Characteristics of Aggregates," contains contributions from six engineers of prominence in this field.

The third and final section comprises a paper by R. W. Crum, director of the Highway Research Board, discussing "The Number of Specimens or Tests Required for Reasonable Accuracy."

When this report is printed, as it soon will be, it will be of very practical value to the construction industry, for it will present an effective summation of the significance, limitations and applicability of the more widely used tests.

## *Decentralize the PWA*

**I**T is becoming increasingly evident that the administration of the federal public works program, headed by Secretary Ickes, of the Department of the Interior, has allowed itself to become enmeshed in a tangle of red tape.

Doubtless much of the delay is due to the apparent desire to handle everything in Washington. Projects may be recommended for approval by state engineers and advisory boards, but final approval is reserved as the prerogative of the administrator and the Public Works Board which he heads.

This means that the Board's legal division, its engineering division, and its financial division, all newly organized and working under pressure, are trying to pass on the validity of all projects.

To an outsider it would appear the part of wisdom to delegate the approving authority to the separate state engineers and advisory boards, setting up in each state a competent group for that purpose.

One man can not do it all. The real test of administrative efficiency lies in the ability to select and organize responsible subordinates to carry the load.

## *Another Court Decides Against Diversion*

**O**NE by one the courts are handing down decisions against diversion of gasoline tax funds.

The Minnesota and Illinois cases, mentioned on this page in the June and July issues, have now been strengthened by a municipal case in Cincinnati, where Judge Nelson Schwab of the common pleas court held illegal the city's attempt to divert \$159,000 from the motor vehicle license and gasoline tax funds for purposes other than the construction, maintenance, repair or re-paving of public streets and roads. The diverted funds were ordered returned to the road fund.

The case against diversion is gaining strength. Doubtless the forces that are fighting this evil are preparing additional legal attacks on existing laws and ordinances which permit diversion. In the court decisions here mentioned the friends of good roads have a powerful weapon.

# PROGRESS — In a Page

◀ Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups. ▶

## ***Cotton Pads Improve Curing of Concrete***

A NEW use of cotton and a better method of curing newly laid concrete roads may result from tests completed recently by the U. S. Bureau of Public Roads.

The tests of the bureau consisted of preparing concrete slabs and covering them with cotton mats, and burlap. One slab was left uncovered.

The mats, which were submitted by the Texas state highway department, consisted of plies of raw cotton separated by loosely woven cotton cloth. Mats of from 1 ply to 9 plies and from one-third inch to three inches in thickness were used.

All of the cotton mats appeared to be effective curing agents and gave better results than burlap. With a one-ply cotton mat the rise in temperature from early morning to the hottest part of the day was only 60 per cent of that under burlap and about one-third of that of unprotected concrete.

The bureau has suggested to the state highway departments that they give consideration to the use of cotton mats for curing, at least in an experimental way; and that if the cost can be kept within reasonable limits, this method may provide: (1) An improved method of curing; (2) Protection against damage due to freezing; and, (3) A market for a moderate quantity of very low grade cotton.

The Bureau of Public Roads, in co-operation with the Bureau of Agricultural Economics and interested state highway departments, is planning to conduct large-scale field tests to study further the effectiveness and the practicability of using cotton pads for curing concrete.

A complete report on the tests is published in the (July) (1933) issue of *Public Roads*, issued monthly by the U. S. Bureau of Public Roads.

## ***Cost of Highway Construction***

AN index of the cost of highway construction is given in a 12-page report by J. L. Harrison, senior highway engineer, division of management, United States Bureau of Public Roads, published in the July (1933) issue of *Public Roads*.

The results of this study show that unit prices for highway excavation, surfacing, and structures declined steadily from 1923 to the second quarter of 1932. Since that date a definite upturn in unit prices has been noted. The combined effect of these trends is shown in the index of the cost of a composite mile of highway, which is based on the assumption of equal quantities of excavation, surfacing, and structures per mile in each year.

## ***Changes in Specifications for Cement-Bound Macadam***

Some changes have been made in the specifications for cement-bound macadam road construction as printed on pages 9 and 10 of the May (1933) issue of *CONCRETE*.

The changes are the result of the inspection of many old cement-bound macadam pavements in the East during the spring of this year.

Copies of the complete revised specifications can be obtained from the Portland Cement Association, 33 W. Grand Ave., Chicago.

## ***Testing Durability of Cement Mortars***

THE paper on "Durability of Cement Mortars; the Cement and Method of Testing Major Variables," presented at the 1933 annual meeting of the American Society for Testing Materials by Prof. C. A. Hughes, University of Minnesota, includes data on absorption, compressive strength, resistance to sodium sulphate, and on three artificial cycles of freezing and thawing.

Mortar specimens were made from 18 brands of portland cement and 10 special cements. A study was made of the relations prevailing between the above properties of the mortars, where definite relations were found to exist. In addition, the report discusses the durability of mortars as measured by immersion in a ten per cent solution of sodium sulphate; and by artificial freezing and thawing.

The full paper is to be published in the 1933 *Proceedings* of the A. S. T. M.

## ***Gypsum Specification Now A. S. A. Standard***

SPECIFICATIONS for gypsum, recently submitted to the American Standards Association by the American Society for Testing Materials, have been approved as an A. S. A. standard, under the serial designation of (A. S. T. M. C22-25) (A49.1-1933).

Copies of this specification may be obtained either from the A. S. A. or the A. S. T. M. at 25 cents each.

## ***Federal Specifications for Aggregate***

SPECIFICATIONS for Portland Cement Concrete Aggregate, published under the symbol SS-A-281, have been adopted officially by the Federal Specifications Board, Washington, D. C., effective November 1, 1933.

Copies of the new specification, which supersedes two earlier documents, may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

## ***1400-Ft. Concrete Arch Bridge Proposed for India***

Dr. M. A. Korni, of Bird & Co., Calcutta, proposes a reinforced concrete arch structure, with a span of 1,400 ft., for a new bridge to be built over the Hooghly River, in India.

Estimates indicate a cost considerably below the cost of a steel structure.

# Light-Weight Aggregate Specification

## Proposed by A. S. T. M.

Requirements Cover Weight, Amount of Deleterious Materials, Grading, Mortar Strength, and Durability—Criticisms Invited

**P**ROPOSED Tentative Specifications for Light-Weight Aggregates have been prepared by A. S. T. M. Subcommittee IX (H. F. Clemmer, chairman) and were submitted for consideration at the recent annual meeting of the American Society for Testing Materials.

The need for such specifications has been apparent for some time because of the increasing use of light-weight aggregate. Criticisms of the proposed specification are solicited and should be addressed to R. R. Litehiser, secretary of Committee C-9, Ohio State Highway Department, Columbus, Ohio. The proposed specifications follow:

### (Beginning of Specifications)

#### Scope

1. Aggregates classified as light-weight aggregates shall conform to the following weight requirements, measured in a surface-dry and loose condition:

##### Fine Aggregate:

|                |                    |
|----------------|--------------------|
| Minimum weight | 40 lb. per cu. ft. |
| Maximum weight | 70 lb. per cu. ft. |

##### Coarse Aggregate:

|                |                    |
|----------------|--------------------|
| Minimum weight | 30 lb. per cu. ft. |
| Maximum weight | 55 lb. per cu. ft. |

**NOTE: Quality of Aggregates.**—It is recognized that for certain purposes satisfactory results may be obtained with light-weight materials not conforming to these specifications. In such cases the use of fine or coarse light-weight aggregates not conforming to these specifications should be authorized only under special provisions based upon laboratory studies of the possibility of designing a mixture of light-weight materials to be used on the job that will yield concrete equivalent to the specified mixture made with light-weight material complying with these specifications in all respects.

### FINE LIGHT-WEIGHT AGGREGATE

#### General Characteristics

2. Fine light-weight aggregate shall consist of inert materials such as burned shale or clay, tuff, pumice, slag, etc., having hard, strong, durable particles which may or may not be vesicular and shall conform to the requirements of these specifications.

#### Deleterious Substances

3. (a) The amount of deleterious substances shall not exceed the following maximum requirements:

|                                                                                                     | Maximum<br>Permissible<br>Percentage<br>by Weight |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Removed by decantation*                                                                             | 3                                                 |
| Coal                                                                                                | 1½                                                |
| Clay lumps                                                                                          | 1½                                                |
| Other deleterious substances (such as shale, alkali, mica, coated grains, soft and flaky particles) | —                                                 |
| Total clay lumps, coal, soft fragments, and other local deleterious substances                      | 6                                                 |

**NOTE.**—It is recognized that under certain conditions percentages of deleterious substances less than those shown in the table should be specified as a maximum.

\*In the determination of the percentage removed by decantation, care must be taken to recover all aggregate removed by the test. Due to the specific gravity of most light-weight aggregates, a large percentage of the aggregate may float.

(b) All fine light-weight aggregate shall be free from injurious amounts of organic impurities. Light-weight aggregates subjected to the colorimetric test for organic impurities and producing a color darker than the standard shall be rejected unless they pass the mortar strength test as specified in Section 5.

#### Grading

4. (a) Fine light-weight aggregate shall be well graded from coarse to fine and when tested by means of laboratory sieves having square openings shall conform to the following requirements.

|                         | Percentage<br>Passing Laboratory<br>Sieves Having<br>Square Openings |
|-------------------------|----------------------------------------------------------------------|
| Passing a ¾-in. sieve   | 100                                                                  |
| Passing a No. 4 sieve   | 85 to 100                                                            |
| Passing a No. 16 sieve  | 45 to 80                                                             |
| Passing a No. 50 sieve  | 5 to 30                                                              |
| Passing a No. 100 sieve | 0 to 15                                                              |

#### Uniformity

(b) The above gradation for fine light-weight aggregate represents the extreme limits which shall determine the suitability for use of fine light-weight aggregate from all sources of supply. The gradation of fine light-weight aggregate from any one source shall be reasonably uniform and not subject to the extreme percentages of gradation specified above.

(c) In case the concrete resulting from a mixture of light-weight aggregates approaching the extreme limits for gradation is not of a workable character, or when finished does not exhibit a proper surface, due to an excess of particles approximately ⅛ to ½ in. in size, either a fine light-weight aggregate having a sufficiently greater percentage of fine material, or a coarse light-weight aggregate having a sufficiently smaller percentage of fine material shall be used.

#### Mortar Strength

5. Fine light-weight aggregates when subjected to the mortar strength test shall develop a tensile or compressive strength at the age of 7 or 28 days of not less than 100 per cent of that developed by mortar of the same proportions, by volume, and consistency, made of the same cement and standard Ottawa sand.

#### Weight

6. Fine light-weight aggregate that meets the grading requirements of these specifications shall conform to the following weight requirements, measured in a surface-dry and loose condition:

|                |                    |
|----------------|--------------------|
| Minimum weight | 40 lb. per cu. ft. |
| Maximum weight | 70 lb. per cu. ft. |

### COARSE LIGHT-WEIGHT AGGREGATE

#### General Characteristics

7. Coarse light-weight aggregate shall consist of inert materials, such as burned shale or clay, tuff, pumice, slag, etc., having hard, strong, durable pieces, which may or may not be vesicular, free from adherent coatings and shall conform to the requirements of these specifications.

#### Deleterious Substances

8. The amount of deleterious substances shall not exceed the following maximum requirements:

|                                                                                              | Maximum Permissible<br>Percentage by Weight |
|----------------------------------------------------------------------------------------------|---------------------------------------------|
| Removed by decantation*                                                                      | 2                                           |
| Raw shale                                                                                    | 1½                                          |
| Coal                                                                                         | 1½                                          |
| Clay lumps                                                                                   | 1                                           |
| Soft fragments                                                                               | 7                                           |
| Other deleterious substances (such as alkali, friable, thin, elongated, or laminated pieces) | —                                           |
| Total shale, coal, clay and soft fragments                                                   | 8                                           |

Note.—It is recognized that under certain conditions percentages of deleterious substances less than those shown in the table should be specified as a maximum.

\*In the determination of the percentage removed by decantation, care must be taken to recover all aggregate removed by the test. Due to the specific gravity of most light-weight aggregates, a large percentage of the aggregate may float.

#### Grading

9. (a) Coarse light-weight aggregate shall be well graded between the limits specified and shall conform to the following requirements:

|                                                       | Percentage Passing Laboratory Sieves Having Square Openings |
|-------------------------------------------------------|-------------------------------------------------------------|
| Passing a ___ in. sieve (maximum size).....           | 95 to 100                                                   |
| Passing a ___ in. sieve (one-half maximum size).....  | 40 to 75                                                    |
| Passing a ___ in. sieve (intermediate as needed)..... | ___ to                                                      |
| Passing a No. 4 sieve.....                            | 0 to 10                                                     |

Note.—Where a range is shown, the engineer should use an appropriate figure within the limits recommended.

(b) In case the concrete resulting from a mixture of light-weight aggregates, or a mixture of light-weight coarse aggregate and ordinary fine aggregate approaching the extreme limits for gradation, is not of a workable character, or when finished does not exhibit a proper surface, due to an excess of particles approximately  $\frac{1}{8}$  to  $\frac{1}{2}$  in. in size, either a fine aggregate (light-weight or ordinary aggregate, as the case may be) having a sufficiently greater percentage of fine materials or a coarse light-weight aggregate having a sufficiently smaller percentage of fine material, shall be used.

(c) In case ordinary fine aggregate is used in combination with coarse light-weight aggregate, the ordinary fine aggregate shall conform to the requirements of the Tentative Specifications for Concrete Aggregates (A.S.T.M. Designation: C 33-31 T) of the American Society for Testing Materials.†

#### Durability

10. Coarse light-weight aggregate shall pass the sodium sulphate accelerated soundness test, except that aggregates failing in the accelerated soundness test may be used if they pass a satisfactory freezing-and-thawing test.

#### Weight

11. Coarse light-weight aggregate that meets the grading requirements of these specifications shall conform to the following weight requirements; measured in a surface-dry and loose condition:

|                      |                   |
|----------------------|-------------------|
| Minimum weight ..... | 30 lb. per cu ft. |
| Maximum weight ..... | 55 lb. per cu ft. |

#### Abrasion

Note.—Many engineers believe that an abrasion test for coarse aggregate to be used in concrete subject to abrasion is important, but no test limits are specified, due to the status of knowledge concerning suitable specification limits for this test. The committee believes that the abrasion test does not necessarily show definite qualities desired in concrete aggregates; also they do not believe that porous aggregates should be used in the wearing surface of concrete subjected to severe abrasion.

†Proceedings, Am. Soc. Testing Mats., Vol. 31, Part I, p. 750 (1931); also 1932 Book of A.S.T.M. Tentative Standards, p. 366.

## From the Patent Office

**PRODUCTION OF CONDENSED CARBON DIOXIDE AND SLOW-SETTING CEMENT—No. 1,905,598.** Chauncey C. Loomis of Lenox, Massachusetts, and Alexander Donald MacDonald of New York, N. Y., Assignors to New England Lime Co. of Pittsfield, Mass. A corporation of Delaware. Patented April 25, 1933.

Chauncey C. Loomis of Lenox, Massachusetts, and Alexander D. MacDonald, of New York, have invented a method of producing carbonic acid gas and slow setting calcium sulphate cement from a limestone and sulphuric acid solution, which comprises finely crushed limestone, bringing the finely crushed limestone and the sulphuric acid solution into intimate contact with each other by continuously feeding them from separate sources of supply at a substantially constant rate into a reacting chamber, in the proportion of not less than about one chemically equivalent weight of limestone to each chemically equivalent weight of pure sulphuric

acid, continuously removing the mixture of sulphuric acid and limestone away from the zone or region where they are first brought into intimate contact with each other, maintaining this intimate contact with exclusion of air until the chemical reaction between the limestone and sulphuric acid is substantially complete and the sulphuric acid is completely neutralized. The carbonic acid gas is then separated from the slow setting calcium sulphate cement.

**CONSISTENCY-CONTROLLING MECHANISM FOR CONCRETE MIXERS—No. 1,904,025.** Perry P. Yohe, of North Hollywood, California, Assignor to Koehring Company of Milwaukee, Wis. Patented April 18, 1933.

In the art of concrete engineering, it is a well known fact that the strength of concrete primarily depends upon a certain proper ratio of water and cement during the initial mixing.

Concrete when mixed with a minimum amount of water, said amount being just sufficient to make the mass workable, acquires a much greater strength than concrete mixed with a greater quantity of water, assuming the quality and quantity of the other ingredients are the same.

To overcome the difficulties arising from variations in moisture content of aggregates, the inventor has devised an apparatus for predetermining the consistency of a mixture of cement, aggregates and water, which consists of placing the ingredients in a moving vessel, utilizing the resistance to movement of the vessel offered by the mixture therein to predetermine the quantity of water required to bring the mixture to a known consistency, and supplying said quantity of water to the mixture.

**DAM—No. 1,906,535.** Edgar H. Burroughs of Scarsdale, New York, Assignor to Ambursen Construction Co., Inc., of New York.

The dam comprises an inclined upstream water bearing deck, a plurality of supports beneath the deck, and extending downstream therefrom, a fill disposed at one end of the dam and forming a continuation of the dam for a substantial distance, an end support for the deck adjacent to the fill and having an upstream and downstream profile substantially the same as that of the adjacent portion of the dam. The end support retains the fill and increases in thickness from its top to its bottom and is projected into the fill a distance sufficient to insure its stability against the thrust of the fill.

**PROTECTING CONCRETE WHILE CURING—U. S. Patent No. 1,909,177, May 16, 1933.** Irving C. Honegger, Houston, Texas.

Thin metallic sheets or foil are spread over the fresh concrete as a means of retaining the water in the concrete during the hydration process. The metal may be any one of several metals readily obtained in the form of foil, but aluminum foil is generally preferred.

The inventor claims that as a curing agent this metal foil is superior to burlap, canvas, straw and similar coverings. The foil is impervious to water, and therefore prevents damage to the concrete from rain.

**MANUFACTURE OF PORTLAND CEMENT—U. S. Patent No. 1,916,716.** Louis A. Dahl and Wilson C. Hanna, Colton, California.

The process includes first calcining to incipient fusion a material containing stack dust and over-saturated with lime, to produce a clinker that is over-saturated with lime, and then mixing the clinker with lime-deficient portland cement clinker and calcining the mixture to produce a final portland cement clinker, the composition of said mixture being such that the lime deficiency in the final portland cement clinker does not exceed 5 per cent.

**CEMENT LOADER AND BAG COUNTER FOR BATCH MIXER—U. S. Patent No. 1,916,531.** John F. Robb, Hanna Building, Cleveland, Ohio. Patented July 4, 1933.

The apparatus comprises a device for elevating and counting bags of cement, or measured quantities of cement, and supplying them to a batch of aggregates and measured quantity of water, thereby providing definite control of the cement content in every batch.

This apparatus can be adapted to paving mixers as well as ordinary concrete mixing plants.

# HOW TO DO IT

• Questions and Answers •  
Consultation and Comment

◀ *A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.* ▶

## Fuel Brick from Coal Slack and Portland Cement

*Several years ago I read somewhere of a brick plant that produces a fuel block or brick made of coal screenings mixed with portland cement. Can you send me any information on this subject?—W. H. J., Athens, Penna.*

You probably have reference to a manufacturer of sand-lime brick in Grand Rapids, Michigan, who introduced this product three or four years ago, primarily for the purpose of keeping his brick plant in operation during the midwinter months, when demand for building brick is at a seasonal minimum.

From Truman A. King, general manager of the brick plant, information is obtained to the effect that their regular brick-making equipment is used to press these fuel bricks. The mixture employed consists of 3 sacks of portland cement to one ton of Pocahontas slack. One ton of slack produces about 1,000 fuel bricks of the regular building brick size. The bricks are cured in the open air, and are sufficiently strong to withstand handling and dumping without undue breakage. It is probable that a different quantity of cement could be used for a different kind of slack or screenings. This point can be determined only from actual experiment.

The coal slack is furnished by local coal dealers, who sell the fuel bricks through their regular sales channels; but in order to avoid an extra handling, deliveries of the fuel are made direct from the storage yard of the brick plant.

It is said that in the form of bricks this fuel is readily salable, at a price much higher than the price of slack, in which form it was, in fact, a drug on the market.

The brick company presses the fuel bricks at a stated charge, but assumes no responsibility in connection with sales, deliveries or collections.

## Vibrating Cast Stone

*We are interested in hand or power-driven machines for the manufacture of colored concrete blocks to resemble natural stones. Can you give us the names of American manufacturers of such equipment, and also tell us about any special devices employed.—H. W. A., Bombay, India.*

Your inquiry has been referred to several manufacturers of equipment for producing cast stone, as this product is called in this country.

As to special devices employed, the outstanding feature is the use of high-frequency vibrators having frequencies ranging from 3,600 to 9,000 revolutions per minute. Some are driven by electric power and others by compressed air. You will find several vibrators of this type advertised in the pages of CONCRETE.

The additional strength and density obtained through the use of high-frequency vibrators is so great an advantage that you should not fail to investigate their applicability to your work.

## Wooden Molds for Concrete Monuments

*I am planning to add concrete monuments to my line of concrete products, and would appreciate information on the construction of wooden molds for such work.—W. I. S., Des Moines, Iowa.*

Your problem is primarily that of manufacturing cast stone, since concrete monuments are one form of cast stone.

Details and descriptions of wooden molds for such purposes will be found in books listed by the Book Department of CONCRETE, particularly the following:

- (1) Manufacture and Uses of Concrete Products and Cast Stone.
- (2) Molds for Cast Stone and Concrete.
- (3) Concrete Monuments, Mausoleums and Burial Vaults.

## Retaining Wall on Piles

*I have a design problem involving the use of pile foundations to support a heavy retaining wall of the gravity type. In none of the textbooks and design tables accessible to me can I find anything on this subject, which involves the computation of loads on piles from a combination of vertical and lateral pressure. Can you refer me to any technical treatise that covers this particular case?—H. H., Chicago, Ill.*

A complete analysis of this case will be found in *Engineering and Contracting* (Chicago), in the issue of August 22, 1917, pages 147-149. You should be able to obtain access to bound volumes of that publication in the libraries of engineering societies, or in the offices of private engineering concerns.

## Concrete Floors for Dancing

*We contemplate the construction of a concrete dance floor in a cave at a popular resort near Memphis.*

*Have you any information as to the method of finishing such a floor? The location within the cave is rather damp, and for that reason a wooden floor would not be practicable.—B. M. E., Memphis, Tenn.*

A booklet on "Concrete Floor Finishes," published by the Portland Cement Association, contains complete specifications for the type of floor finish required for a dance floor. Special instructions on this particular subject will be found on page 18 of the booklet.

## New Books and Pamphlets

### Cost of Cement-Bound Macadam Maintenance

**CEMENT-BOUND MACADAM MAINTENANCE COSTS.** Published by the Portland Cement Association, 33 W. Grand Ave., Chicago; 15 pages, 8½ by 11 in. Available on request. Includes detailed summaries and charts of street maintenance costs for cement-bound macadam, concrete and other types of pavement, covering the last 15 years in Portland, Oregon.

In the decade from 1908 to 1918 Portland built more than a million square yards of cement-bound macadam, a sturdy, low-cost type of pavement which is in the midst of a remarkable revival. All of the Oregon city's yardage is still in service, running in age from 15 to 25 years—an average of 21 years. From 1918 to date, detailed maintenance records were kept and tabulated, and these records show an average yearly maintenance cost of 3 mills per sq. yd., or \$32 per mile.

### Proceedings of Highway Conference

**PROCEEDINGS OF THE NINETEENTH ANNUAL HIGHWAY CONFERENCE**, held at the University of Michigan, February 14 to 16, 1933. Published by the university. Paper cover, 286 pages, 6 by 9 in. Many halftones, line drawings, diagrams and tables.

This publication covers many phases of the work of a state highway department. Some eight or ten of the many papers presented are on subjects of particular interest to highway engineers.

### Book on Practical Concrete

**CONCRETE ENGINEERING**, by J. Singleton-Green. Published as Vol. I of "Practical Concrete," by Charles Griffin & Company, Ltd., 42 Drury Lane, W. C. 2, London, England. Cloth binding, 258 pages, 5 by 7½ in. Illustrated.

Materials used in concrete, the designing of the mix, and the making, placing and curing of concrete, are the subjects treated in this volume. Later volumes will cover properties of concrete, special concretes, and related subjects. The book is well indexed.

### Standards Yearbook, 1933

**STANDARDS YEARBOOK, 1933**, published by the National Bureau of Standards, Washington, D. C. Cloth, 255 pages, 6 by 9 in. Price \$1.00.

This is a useful reference book, for it summarizes current standardization activities and outstanding accomplishments during the year, by the various governmental agencies and by scientific and technical societies and trade associations of all leading countries.

### Cost of Base Coat Plaster

**AN ANALYSIS AND COMPARISON OF COSTS OF BASE COAT PLASTER** is the title of a 52-page mimeograph by Lee S. Trainor, chief engineer of the National Lime Association, 927 15th Street, N. W., Washington, D. C.

Extensive figures are developed on the basis of using lime alone, and also when gauged with portland cement and other cementing materials. Copies of the mimeograph can be obtained on request.

## ORGANIZATIONS

**AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS**; W. C. Markham, Executive Secretary, 1222-24 National Press Building, Washington, D. C.

**AMERICAN CONCRETE INSTITUTE**; Harvey Whipple, Secretary, 641 New Center Building, Detroit, Mich.

**AMERICAN CONCRETE PIPE ASSOCIATION**; M. W. Loving, Secretary, 33 West Grand Ave., Chicago.

**AMERICAN ROAD BUILDERS' ASSOCIATION**; Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.

**AMERICAN SOCIETY OF CIVIL ENGINEERS**; Geo. T. Seabury, Secretary, 33 West Thirty-Ninth St., New York City.

**AMERICAN SOCIETY FOR TESTING MATERIALS**; C. L. Warwick, Secretary-Treasurer, 1315 Spruce St., Philadelphia, Pa.

**ASSOCIATED GENERAL CONTRACTORS OF AMERICA**; E. J. Harding, Managing Director, 222 Munsey Bldg., Washington, D. C.

**BUILDING OFFICIALS CONFERENCE OF AMERICA**; Wm. F. Hurd, Secretary, Room 203, City Hall, Indianapolis, Ind.

**CAST STONE INSTITUTE**; L. A. Falco, Secretary, Chapel St. and Blatchley Ave., New Haven, Conn.

**CEMENT INSTITUTE**; H. C. Lundborg, General Manager, 11 East 44th St., New York City.

**CONCRETE MASONRY ASSOCIATION**; Jack Franklin, Secretary, 7071 Plankinton Bldg., Milwaukee, Wis.

**CONCRETE REINFORCING STEEL INSTITUTE**; R. W. Johnson, Secretary, 333 North Michigan Ave., Chicago, Ill.

**ENGINEERING INSTITUTE OF CANADA**; 2050 Mansfield St., Montreal, Quebec.

**HIGHWAY RESEARCH BOARD**; Roy W. Crum, Director, 2101 Constitution Ave., Washington, D. C.

**JOINT COMMITTEE ON STANDARD SPECIFICATIONS FOR CONCRETE AND REINFORCED CONCRETE**; F. R. McMillan, Secretary, 33 West Grand Ave., Chicago.

**NATIONAL ASSOCIATION FOR BETTER HOUSING**; Henry A. Guthrie, Secretary, 59 East Van Buren St., Chicago, Ill.

**NATIONAL BOARD OF FIRE UNDERWRITERS**; W. E. Mallalieu, General Manager, 85 John St., New York City.

**NATIONAL CONCRETE BURIAL VAULT ASSOCIATION**; J. H. Stuart, Secretary-Treasurer, Bremen, Ohio.

**NATIONAL CRUSHED STONE ASSOCIATION**; J. R. Boyd, Secretary, 1735 14th Street, N. W., Washington, D. C.

**NATIONAL ENGINEERING INSPECTION ASSOCIATION**; B. H. Wither-spoon, Secretary, P. O. Box 1115, Pittsburgh, Pa.

**NATIONAL FIRE PROTECTION ASSOCIATION**; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

**NATIONAL LIME ASSOCIATION**; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N. W., Washington, D. C.

**NATIONAL READY-MIXED CONCRETE ASSOCIATION**; V. P. Ahearn, Secretary, 545 Munsey Bldg., Washington, D. C.

**NATIONAL SAND AND GRAVEL ASSOCIATION**; V. P. Ahearn, Executive Secretary, 545 Munsey Bldg., Washington, D. C.

**NATIONAL SLAG ASSOCIATION**; H. J. Love, Secretary-Treasurer, 1449 Leader Bldg., Cleveland, Ohio.

**NATIONAL TERRAZZO AND MOSAIC ASSOCIATION**; J. M. Fuhrman, Secretary-Treasurer, 524 Brook Street, Louisville, Ky.

**NORTHWEST CONCRETE PRODUCTS ASSOCIATION**; W. P. Hews, Secretary-Treasurer, Yakima, Wash.

**PORTLAND CEMENT ASSOCIATION**; Edward J. Mehren, President; William M. Kinney, General Manager, 33 West Grand Ave., Chicago.

**RAIL STEEL BAR ASSOCIATION**; H. P. Bigler, Engineering Secretary; Builders' Bldg., 228 N. La Salle St., Chicago, Ill.

**WIRE REINFORCEMENT INSTITUTE**; R. D. Bradbury, Director, National Press Bldg., Washington, D. C.

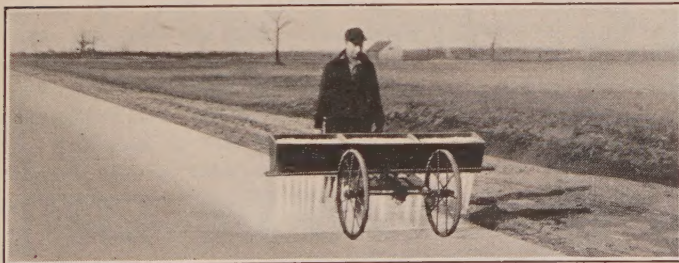
**WISCONSIN CONCRETE PRODUCTS ASSOCIATION**; Jack Franklin, Secretary-Treasurer, 425 East Water St., Milwaukee, Wis.

# IN with the new OUT with the old

## NEW STANDARDS AND MODERN METHODS FOR THE NEW DEAL

*National Recovery is geared to new principles. Wider stretching of highway budgets — greater returns for taxpayers' money — quicker opening to traffic of new paving . . . these demand the most economical, positive, durable and speedy method of curing concrete.*

CURING concrete with Calcium Chloride is an advance in line with the modern design and construction of pavements. Over the entire country engineers in charge of the development of large highway programs have adopted the use of Calcium Chloride for curing. Thousands of miles of smooth, durable pavements constructed over a period of ten years prove the efficiency of Calcium Chloride for curing.

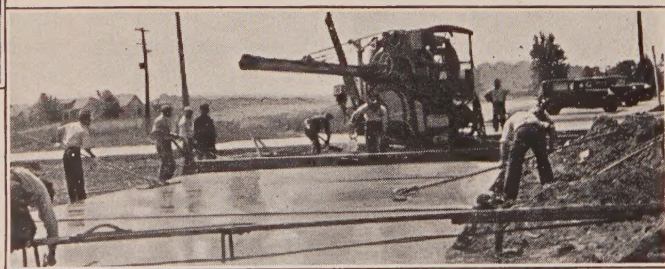


↑ **ON THE SURFACE**—Surface curing with Calcium Chloride is very simple. The Calcium Chloride insures a continuous supply of moisture for curing the concrete—no further attention being required. Calcium Chloride may be spread on the surface of the concrete the first operation in the morning following the placing of the concrete.

Calcium Chloride cures more uniformly and thoroughly than is possible with the old methods of ponding, earth, or straw covering. Either applied on the surface or incorporated in the concrete mix, Calcium Chloride curing is both economical and efficient. It eliminates the necessity of keeping roads closed for long periods and reduces the expense incurred by the traveling public due to the use of detours as caused by the lengthy and older methods of curing. No longer is it necessary to incur expense of hauling, spreading, continual wetting and removal of cover material.

Send—today—for descriptive literature and other details about curing concrete with Calcium Chloride. Address any of the undersigned members of this Association.

↓ **IN THE MIXER**—Calcium Chloride incorporated in the concrete mix not only insures proper curing of the concrete, but accelerates the curing and provides high early strength in the concrete. This added advantage of being able to open pavements at the earliest possible time is secured by this method of curing without added cost. A solution prepared on the job can easily be placed in the mixer drum at the time of mixing.



# CALCIUM

CALCIUM CHLORIDE

The Dow Chemical Co.  
Midland, Michigan

Solvay Sales Corporation  
61 Broadway, New York City

# CHLORIDE

ASSOCIATION

The Columbia Alkali Corp.  
Barberton, Ohio

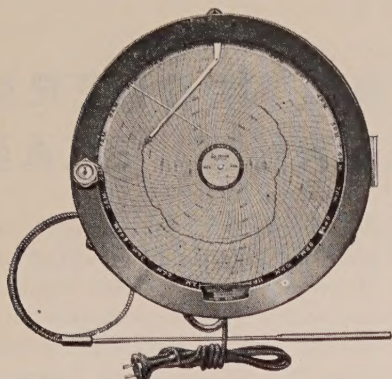
Michigan Alkali Company  
10 E. 40th St., New York City

## FOR MODERN CONCRETE CURING

# EQUIPMENT AND MATERIALS

## New Recording Thermometer and Pressure Gauge

A new and improved line of 8- and 12-in. circular chart instruments has just been placed on the market by the Brown Instru-



ment Company, Philadelphia, Pa. These instruments include thermometers in indicating and recording types for temperatures from 40 deg. F. up to 1200 deg F., and indicating or recording pressure and vacuum gauges for ranges from 10 in. of water up to 5,000 lb. All types are offered in one, two or three pen models.

The mercury-filled helix is built of a special stainless steel which stands 100 per cent overload and provides a surplus of power to move the pen. The gas and vapor type helices are made of heat treated phosphor bronze which gives greatly in-

creased ruggedness and power. These thermometers may be located at distances up to 200 ft.

## Federal Motor Announces Three New Trucks

The production of three new 6-cyl. trucks by the Federal Motor Truck Co., Detroit, Mich., is announced by M. L. Pulcher, president. These new chassis, designated as 15A, 20A and 25A, rated at 1½ ton, 2 ton and 2½ ton respectively, embody the latest advancements in truck development.

The outstanding characteristic of these new trucks is their unusually sturdy and substantial construction.

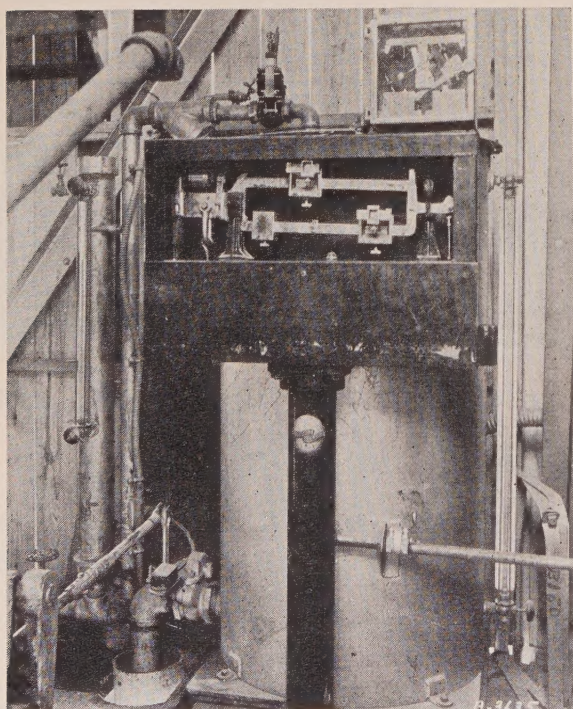
These new models are equipped with 6-cyl., 7 bearing truck engines which furnish plenty of power at a low governed engine speed. All three engines are similar in design but differ in size. Each is governed at 2,600 r.p.m.

## Automatic Water Weighing and Measuring Tank

The new Blaw-Knox automatic water tank is used for accurate measurement of water in concrete mixing plants. Essentially, this unit consists of a cylindrical water tank mounted on a platform scale. The scale is equipped with a double beam, both beams being graduated in gallons.

The required number of gallons of water is established by means of the poise on the upper beam. Deduction for moisture contained in the aggregate is obtained by setting the poise on the lower beam with the number of gallons of water in the aggregate. This is all the setting that is required, according to the Blaw-Knox Co., Pittsburgh, Pa.

The inlet valve is opened by means of a pushbutton control located in any position on the plant that is convenient. Water flows into the measuring tank until the weighing beam balances. The weighing scale is equipped with a springless type indicator with electrical contact, so that the valve is instantly closed when contact is made.



## Rex Makes Improvements on Truck Mixer Equipment

Widening of the truck mixer field has been the aim of the constant development work conducted by the Chain Belt Co., Milwaukee, Wis. Attention has been focused on three units of equipment—Jackass hoist, the One-Man Spout, and the Moto-Mixer.

The Jackass hoist, developed by Rex and the Heil Co. of Milwaukee, and introduced to the trade in 1931, is a hydraulic hoist especially designed for this mixing unit and fitted to the rear end of the truck chassis. The hoist raises the discharge end of the drum to a height of approximately 8 feet above the ground and from this height the concrete can be chuted over an area approximately 75 per cent greater than with ordinary truck mixers.

Another outstanding Rex development is that of the One-Man Spout. When the Moto-Mixer is traveling, the chute rides beside the drum replacing one fender, and when on the job one man swings it out of its cradle and into position, hooks the supporting rod, and is ready to pour in less than one minute. In action, the new type spout is said to be perfectly balanced and so light that a man can handle it with one hand.

The 1933 Rex Moto-Mixer is the same in design as the 1932 unit, and only minor refinements in construction have been made over the previous model.

The location of the drum rollers and bearings permits Rex to hang the wide Moto-Mixer drum down between the body sills, and provides an extremely low center of gravity for Jackass hoist equipped machines.

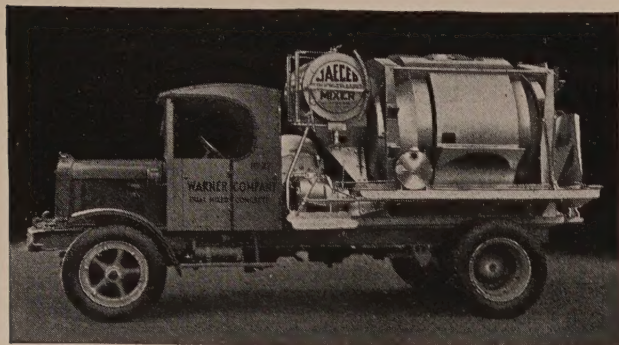
## New Lubricant Has Pure Metallic Lead Base

Lead that has been broken down into such finely divided parts as to be virtually a soluble is the protective element of a new lubricant known as Bestolife.

The product forms a thin protective film of lead on all contacting surfaces, changing such surfaces to a continuous, unbroken, anti-frictional area, according to the Armite Laboratories, Los Angeles, Calif., who are the manufacturers. A descriptive bulletin may be obtained by addressing the firm at 1450 East 61st Street.

The minimum constituency of lead in Bestolife is 15 per cent, ranging up to 65 per cent. It is claimed to withstand temperatures up to 430 deg.

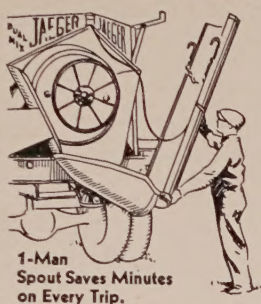
## They Get the JOBS



### ..that's why JAEGER TRUCK MIXERS Outsell All Others

Because they offer every facility for the faster delivery of better concrete ("Dual-Mix" action, 1-man chute, dual controls, rapid accurate water tank and patented discharge) Jaeger Truck Mixers get most of the jobs, serve them at lowest cost, and continue to outsell all other makes. Sizes 1 to 5 cubic yards.

Write for details, prices.



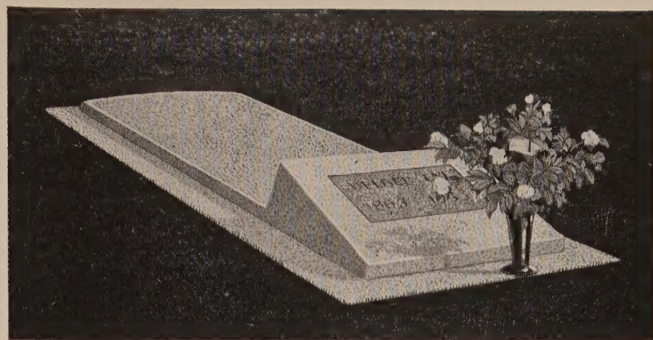
THE JAEGER MACHINE CO. 522 Dublin Ave., Columbus, Ohio

## Better Placements Lower Costs

### The MUNSELL Air-Driven Vibrating Blade

Write for "Specification  
for Placement of Concrete  
by Mechanical Vibration."

Munsell Concrete Vibrators  
997 West Side Avenue  
Jersey City, N. J.



## In Memory of—

*business without profit . . .  
equipped IDLE plants . . .  
search for a new product  
to make and SELL! . . .*

Not yet gone, but soon to be forgotten, is business *without* profit—especially for the concrete products manufacturer who reads this and acts promptly. If you have plant facilities of the proper kind (or the set-up necessary to obtain them), idle hands groping for something to make and SELL, let this be *in memoriam* of all that!

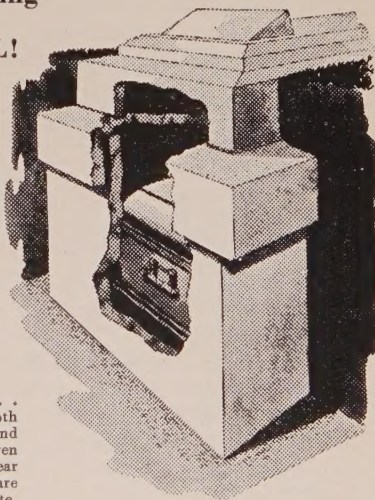
The SURFACE-SEPULCHER—The Modern *Earthless* Grave—can be a monument over your red ink of recent years, and a tablet commemorating your start on the road to recovery.

### An Ideal Manufacturing Franchise—Ideal Merchandise to SELL!

Here is a manufacturing proposition that fits right in with the modern concrete products plant, or into the scheme of aggregate producers wishing to establish such an outlet. Here is a product with tremendous and favorable *public acceptance!* When seeing one installed, or visiting cemeteries where these beautiful tombs mark the landscape, people remark, "Isn't it beautiful and restful! Why didn't some one think of that before!" And the idea spreads, the demand increases—and some alert firm profits thereby.

### Write or wire at ONCE for complete details

Let us tell you the full story . . . show you the facts and plans, both manufacturing, merchandising and advertising that have already proven successful . . . Here is a year around business . . . Territories are being snapped up fast . . . Write, wire or phone at your earliest convenience. All replies confidential.



Designed by THE NEFF AND FRY CO., Camden, Ohio

Address all inquiries to—

EUGENE F. OLSEN CO., 105 Tabor St., Adrian, Mich.  
(Exclusive Distributor of Neff & Fry Vault Equipment and Licenses)



# NOTES AND NEW CATALOGS

## Manufacturers' News

### Pottscos Plan and Literature

The Pottscos Sales Co. of Michigan has been organized and is now operating, according to the parent firm, the Pottscos Corp., Chicago, Ill.

Some fifteen or twenty manufacturing plants, it is announced, will shortly be producing the light-weight slag aggregate under a general plan detailed in a leaflet issued during August.

A new Pottscos folder is that entitled *Want to Save Money?* It presents the paramount features of Pottscos such as economy, light-weight, insulating qualities, and high compressive strength, and tells why its use cuts costs.

### Yale & Towne Acquisition

The Yale & Towne Manufacturing Co., with executive offices in the Chrysler Building, New York, announce the purchase of the Walker Vehicle Co. and the Automatic Transportation Co., of Chicago, makers of industrial electric trucks and commercial electric street vehicles, which lines supplement and complement the lines already manufactured by the company.

### Sepulcher Well Received

The Neff and Fry Surface Sepulcher has created an astonishing amount of interest, according to the Eugene F. Olsen Co., Adrian, Mich., distributors. It is apparent, they state, that there are a large number of concrete products manufacturers who feel that there is an immense field for the use of concrete in new ways and that future profit lies in new products or in doing old things in a new way.

### T R C Project

Temperature-resisting cement was used in the construction of a section of pavement begun August 15 in Manitowoc County, Wis., directly north of the city of Manitowoc. This cement is a product of the T R C Corporation of Milwaukee, Wisconsin.

### Rex Machinery on Bridge Project

A new application for Moto-Mixers will be put into operation at the San Francisco-Oakland Bay bridge project, on which

work has begun, according to the Chain Belt Co., Milwaukee, Wis.

Twenty-one especially built Rex Moto-Mixers, twenty-eight complete Rex-Stearns belt conveyors, and a Rex super-size mixer for the central mixing plant are now being

built and shipped to the site of the bridge. The Moto-Mixers are of 3½-yd. capacity equipped with electric motor drive and are to be mounted in the hull of a fleet of barges, in groups of four or two in each barge.

## Industrial Literature

### New Steel Book

Joseph T. Ryerson & Son, Inc., Chicago, Ill., have just published a larger and much more complete stock list than any of their previous issues. The new books run over 200 pages and include complete information and data on practically every kind of steel that is made, including all special grades of cold finished steels, alloy steels, stainless steels, etc., as well as brass, copper and other non-ferrous metals.

### Wheel Dumptor

The Koehring Wheel Dumptor is described in a new bulletin issued by the National Equipment Co., Milwaukee, Wis. The booklet illustrates the machine as applied to various types of jobs and gives a complete description of its second-saving features.

A few of the features pointed out are the ample tractive area, gravity dump, and easy loading.

### Hard Wearing Floors

A group of specification file leaflets on Duromit floors, has been issued by the American Fluresit Co., Cincinnati, Ohio.

Data include architects' and engineers' specifications, official laboratory test results on wear resistance, tensile and compression tests and heavy traffic and wear installations for which Duromit is suited.

### Fermenters and Storage Tanks

What is probably its first publication on acid and alkali tanks has been issued by the Turner-Rostock Corp., New York City. It is entitled *Rostock Fermenters and Storage Tanks of Concrete*.

European installations and structures are shown, and features of the system pointed out.

### X-Ray Apparatus

Philips Metalix portable industrial x-ray apparatus and its use in industry are told in a new publication issued by the Industrial X-Ray Corporation, Los Angeles, Calif.

### Sil-O-Mix New Name

Haymon Krupp & Co., of El Paso, Texas, producers of various products of diatomaceous earth, pumice stone, and filtering and refining clays, have adopted the name *Sil-O-Mix* for the high-silica concrete admixture, in place of the name *Cel-O-Lite*, previously announced by that company.

### Calcium Chloride Reprint

*Curing of Concrete Pavements with Calcium Chloride* is the title of an article by H. F. Clemmer and available from the Calcium Chloride Association, Detroit, Mich., or its member companies.

This is in reprint form, having appeared in a recent issue of a highway paper.

### Dam Construction

Volume 3 of *The Story of Hoover Dam* is now available from the Ingersoll-Rand Co., New York City.

This booklet contains descriptions of the railroad system, the gravel-treating and concrete-mixing plants, the lining of the diversion tunnels, and the Colorado Aqueduct which will transport water to Los Angeles.

### Testing Equipment

Portable testing equipment providing the required voltage or current when and where desired is covered in *Bulletin GEA-1754*, issued by the General Electric Co., Schenectady, N. Y. Specifications and illustrations are included.

The turn of a crank assures power over the entire range from zero to maximum on G-E equipment, it is stated.

### Air Compressor Bulletins

The Worthington Pump & Machinery Co., Worthington, N. Y., has recently issued a group of 8-page booklets on portable air compressors. Units described range in capacity from 120 to 360 cu. ft. per min. The bulletins are of series *W-850-B*, numbered 32, 33, 34 and 37 respectively.